



Advances in the chemical vapor deposition (CVD) of Tantalum

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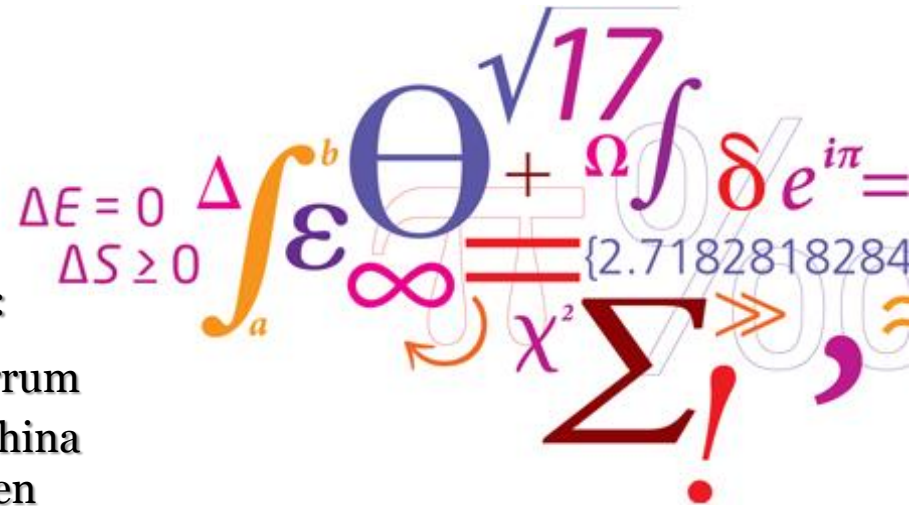
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CHEMICAL VAPOUR DEPOSITION (CVD) OF TANTALUM

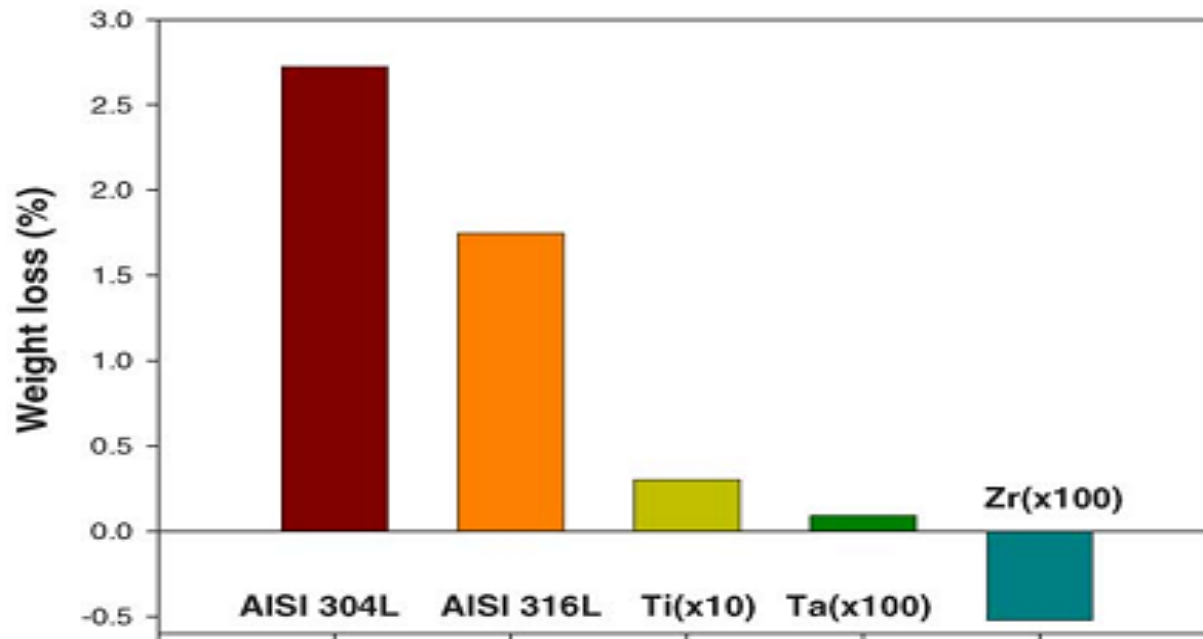
- In Long narrow channels

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Irina Petrushina
Søren Eriksen
Erik Christensen



Why Tantalum?



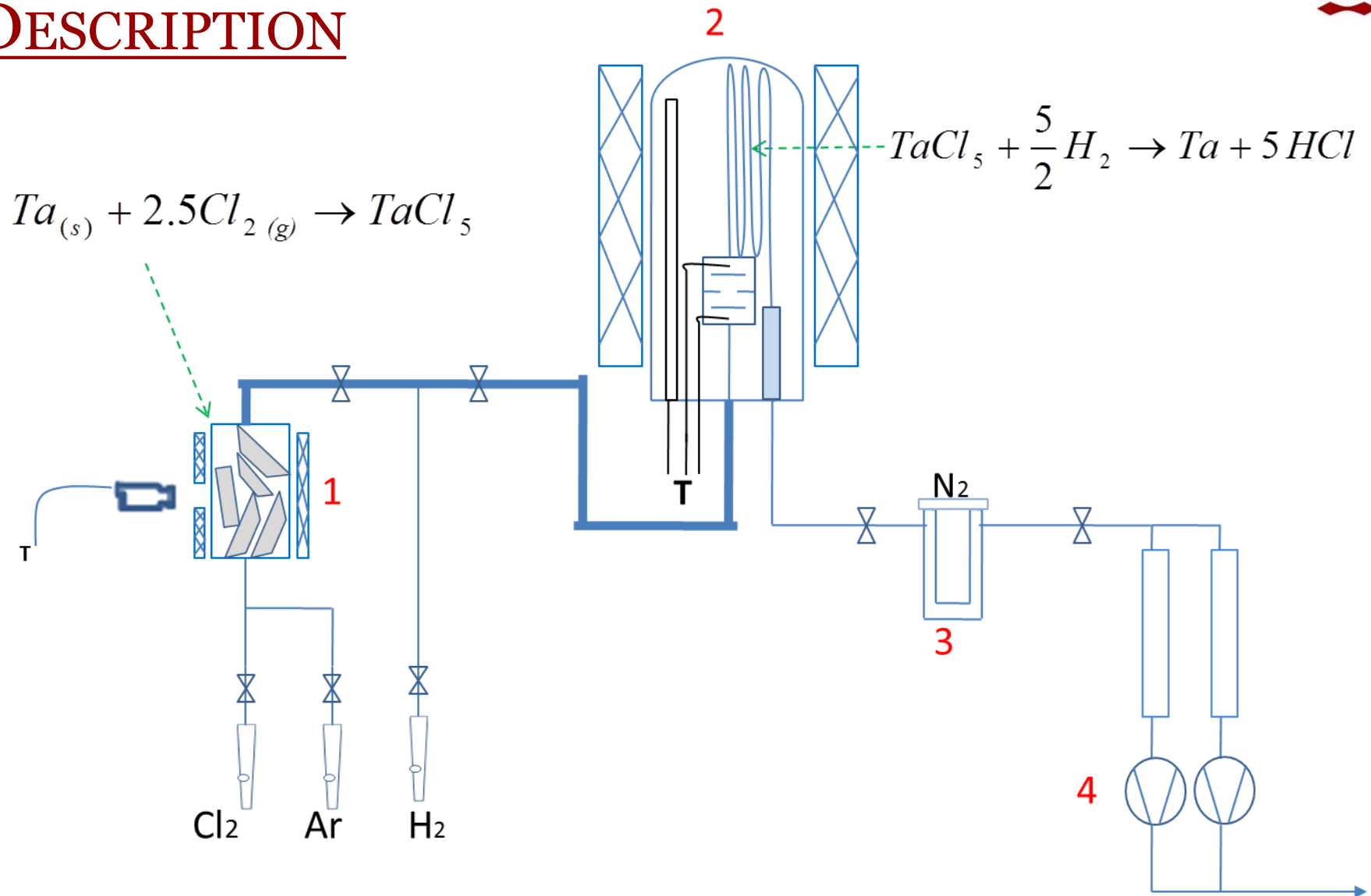
Percentage Weight loss in 10 wt % HCl, room temperature, α -alumina abrasives and 1000 rpm for 168 hours.

Erosion-corrosion of stainless steels, titanium, tantalum and zirconium. Bermudez, Maria-Dolores, et al. Cartagena : Elsevier, 2004.

Tantalum Coated Plate Heat Exchanger



SYSTEM DESCRIPTION



Long narrow Channel: Tubes

Fluid Flow: Navier Stokes

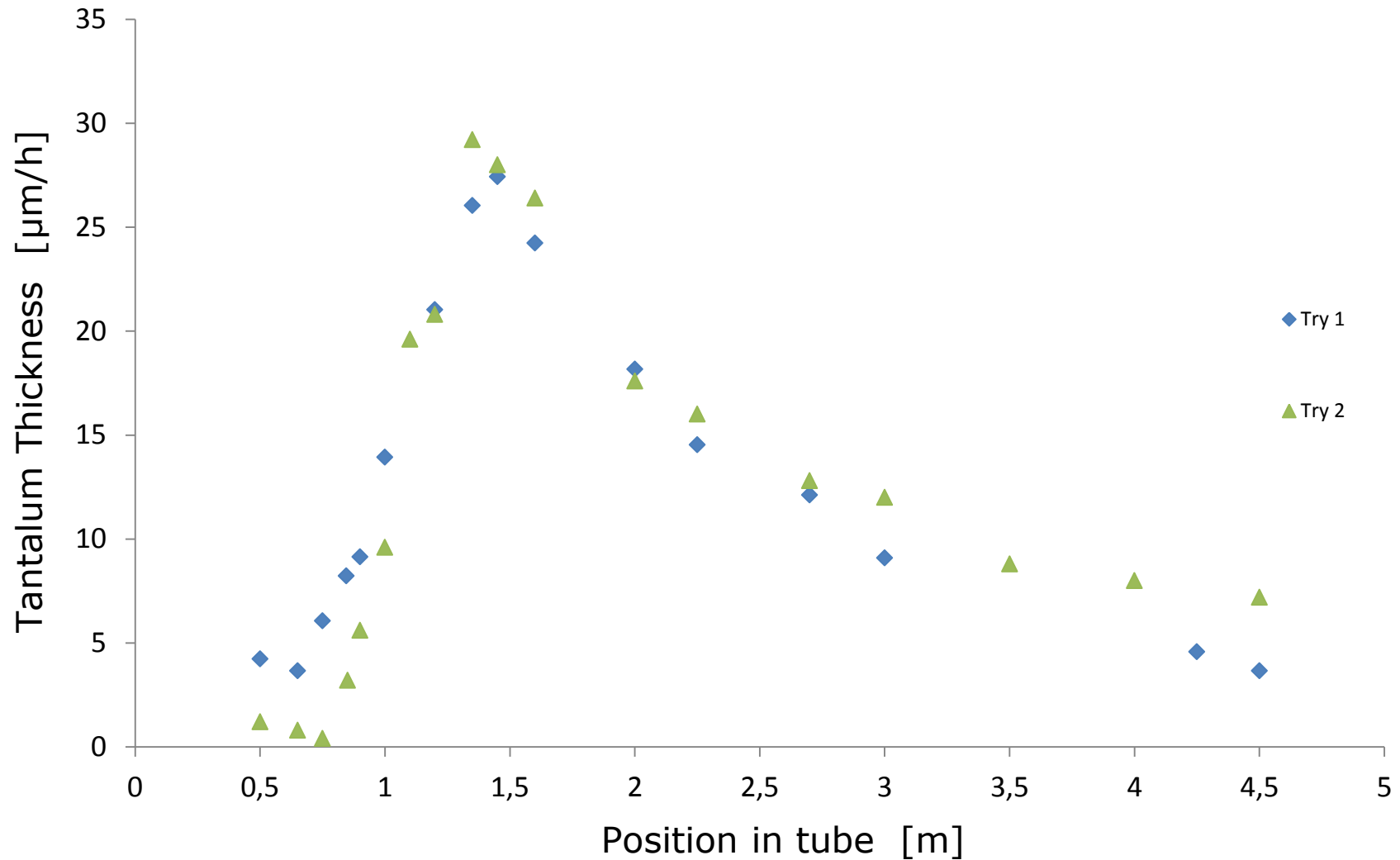
Diffusion: Fick's Law

Chemical Reaction: Arrhenius

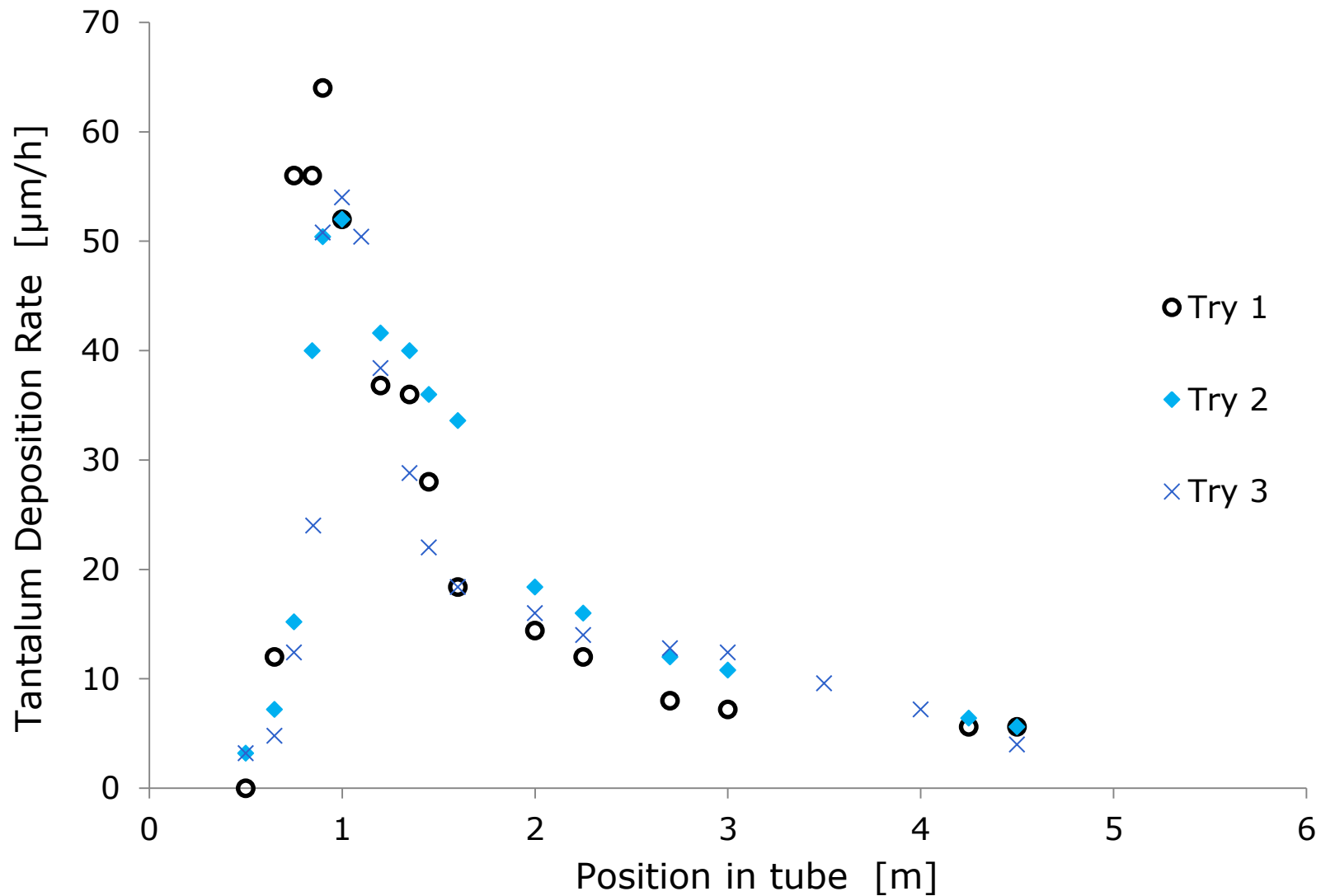
Adsorption: Langmuir

Results:

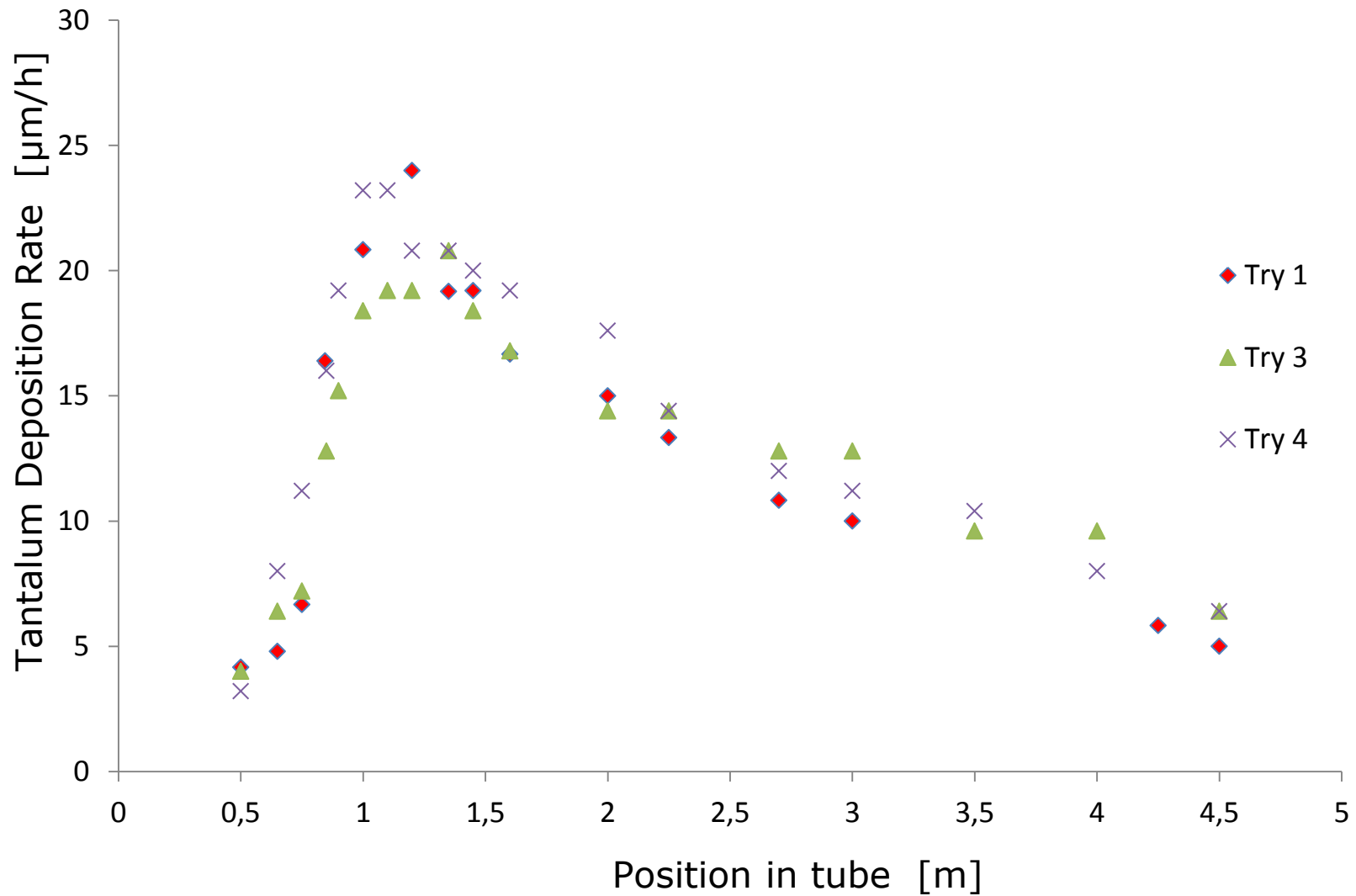
Experiment 800°C, 25 mbar



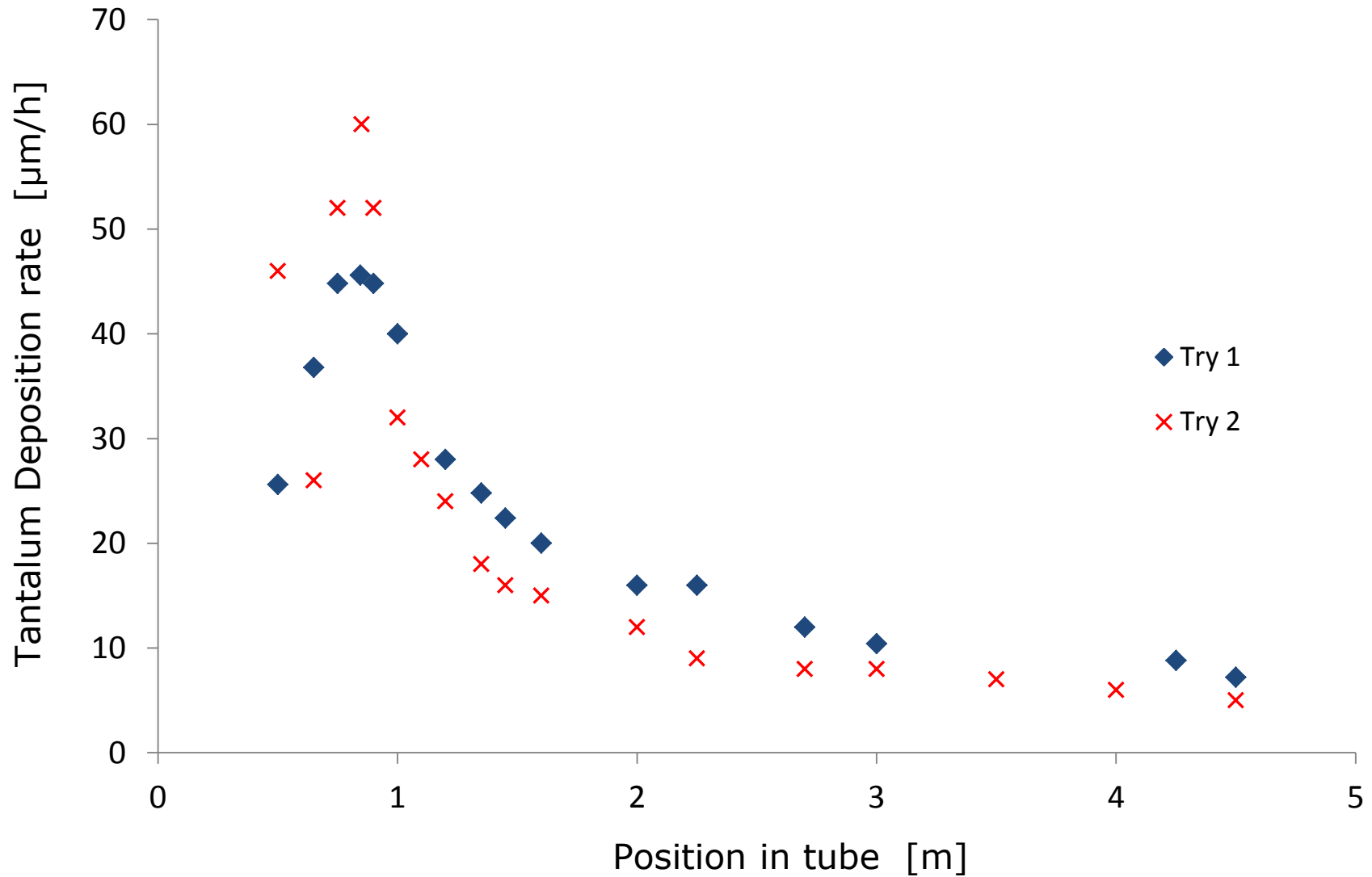
Experiment 850°C, 25 mbar



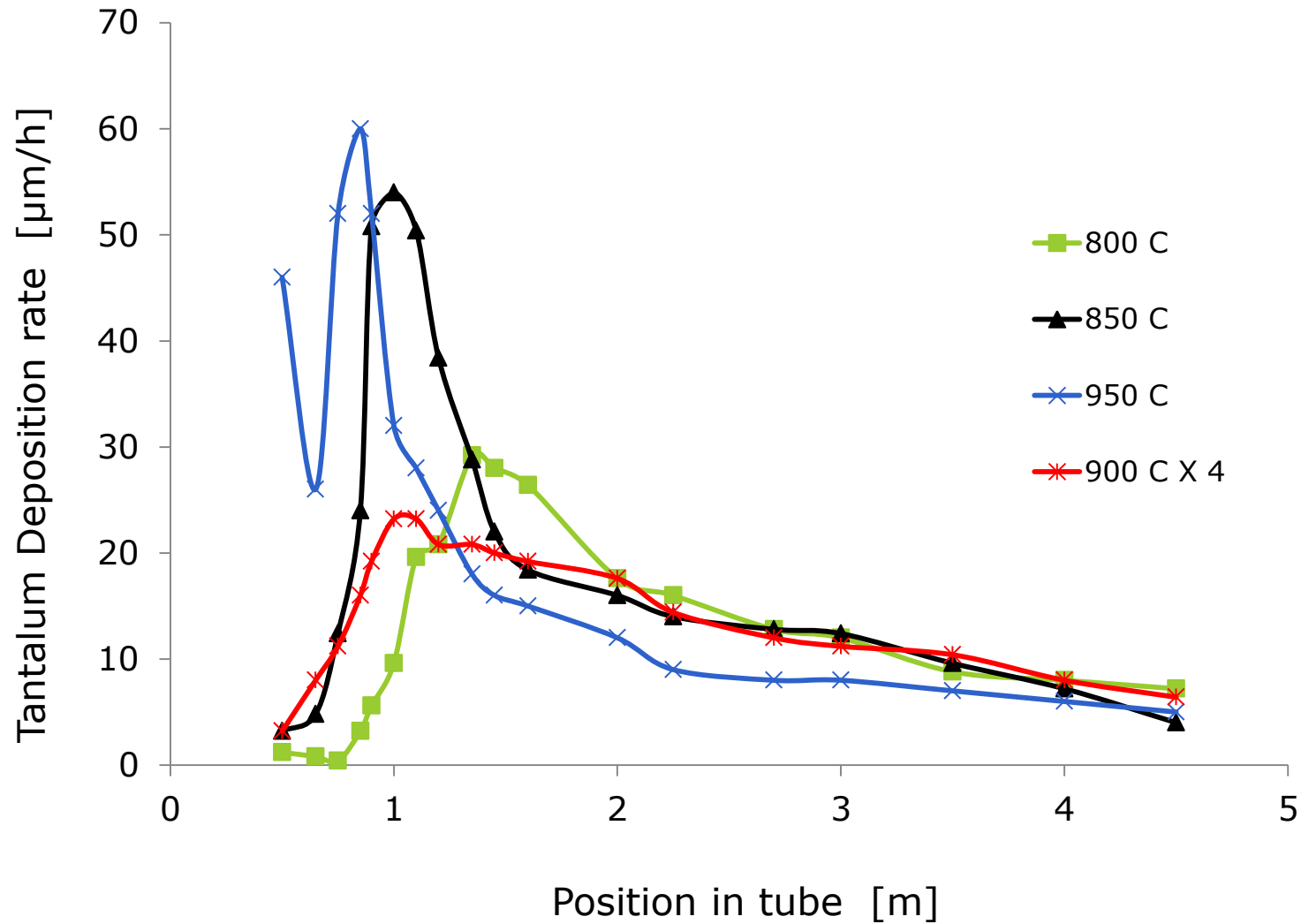
Experiment 900°C, 25 mbar



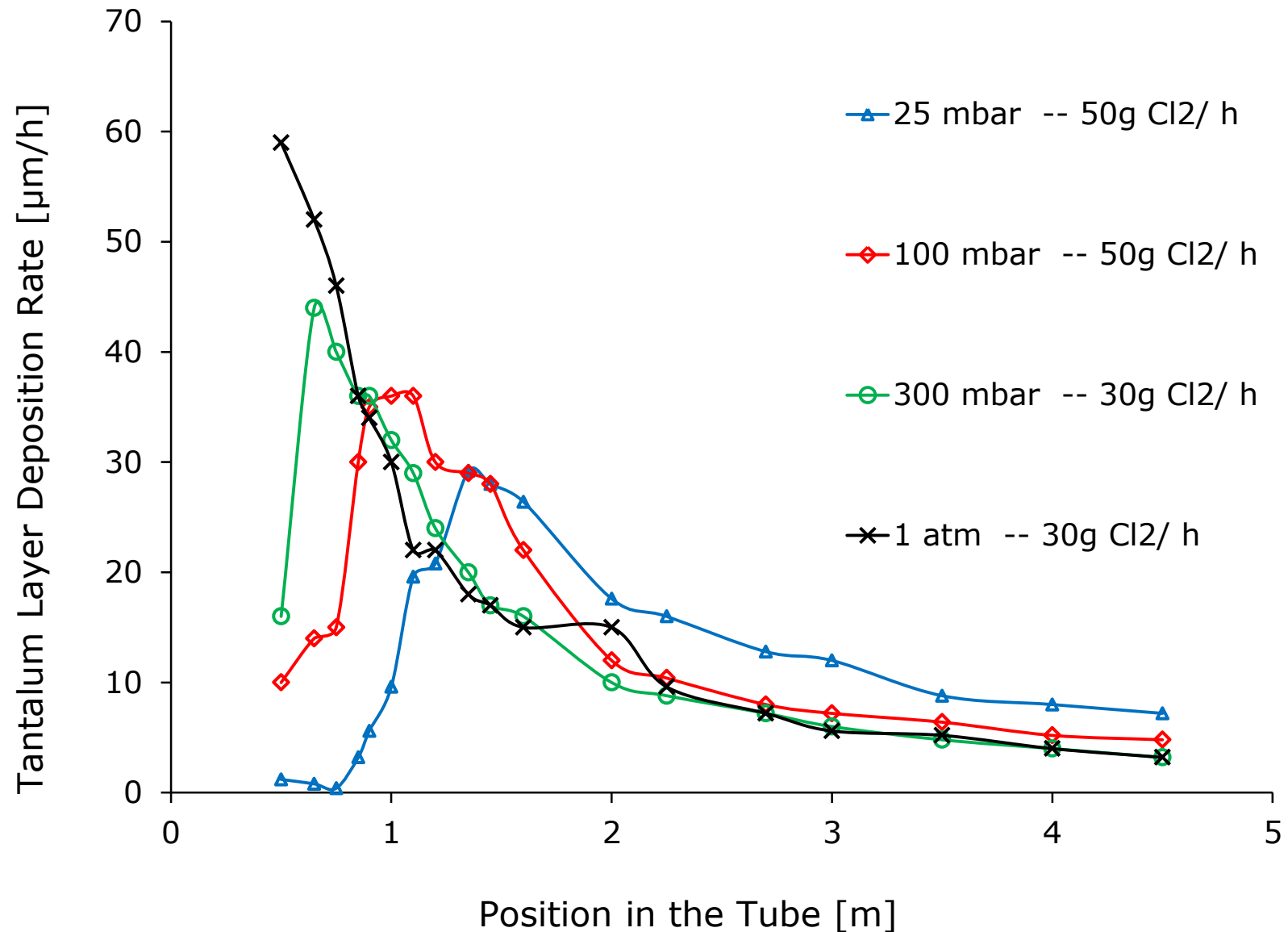
Experiment 950°C, 25 mbar

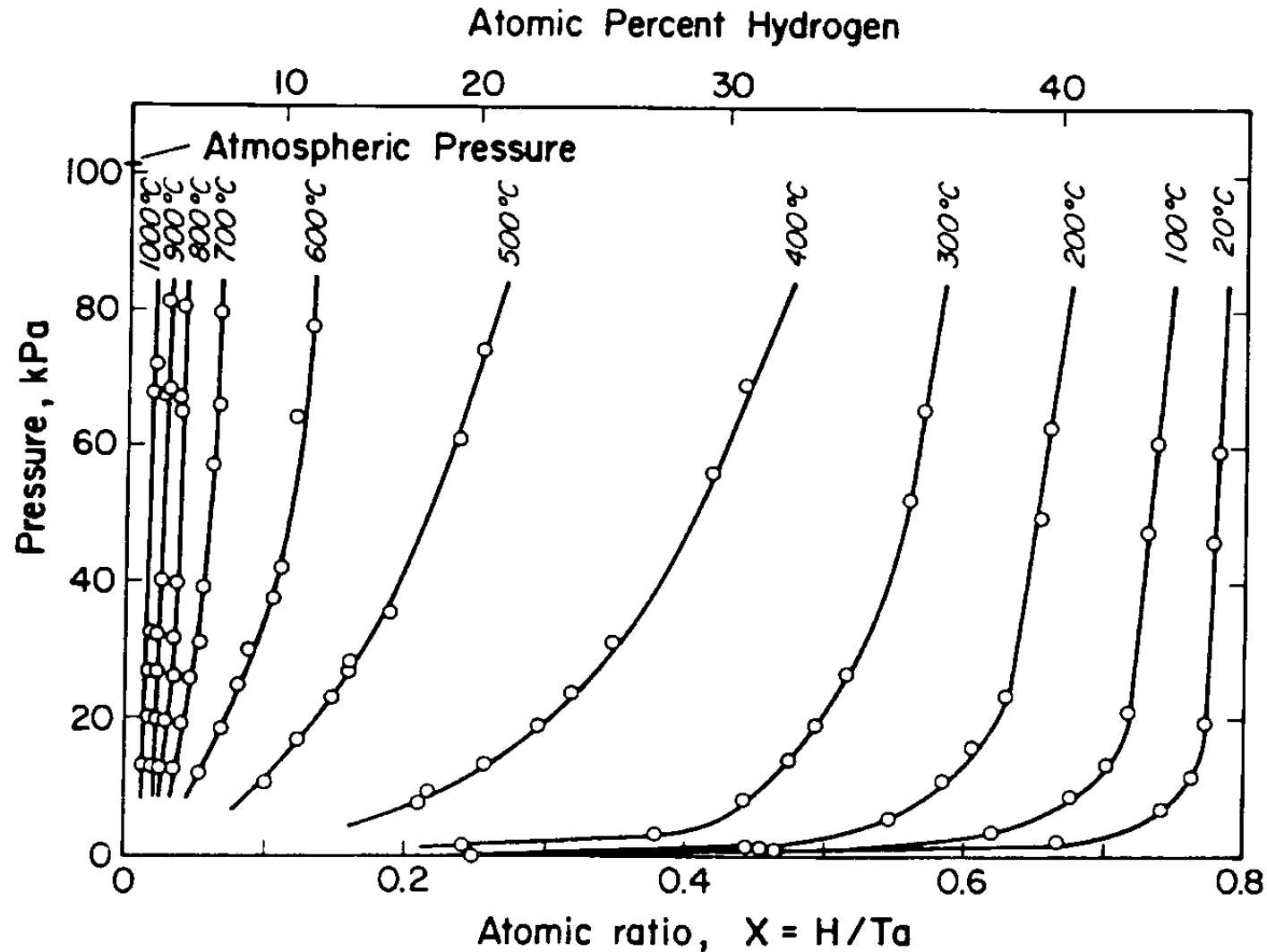


All Temperatures, 25 mbar



All Pressures, 800 °C





F. D. Manchester, *Phase Diagrams of Binary Hydrogen Alloys*, ASM International, 2000.

Model Fitting

Fluid Flow: Navier Stokes

Diffusion: Fick's Law

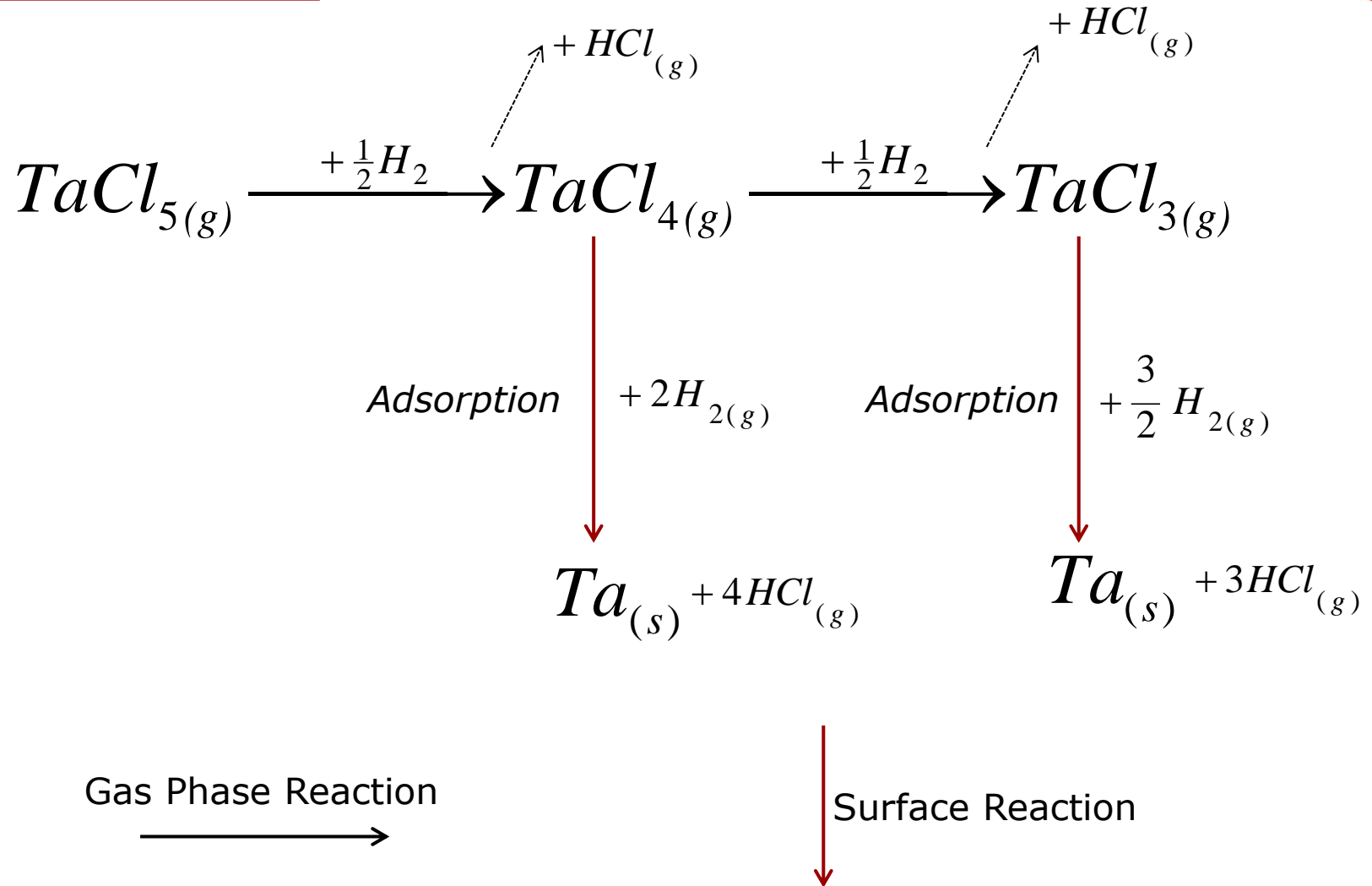
Adsorption: Langmuir

Chemical Reaction: Arrhenius

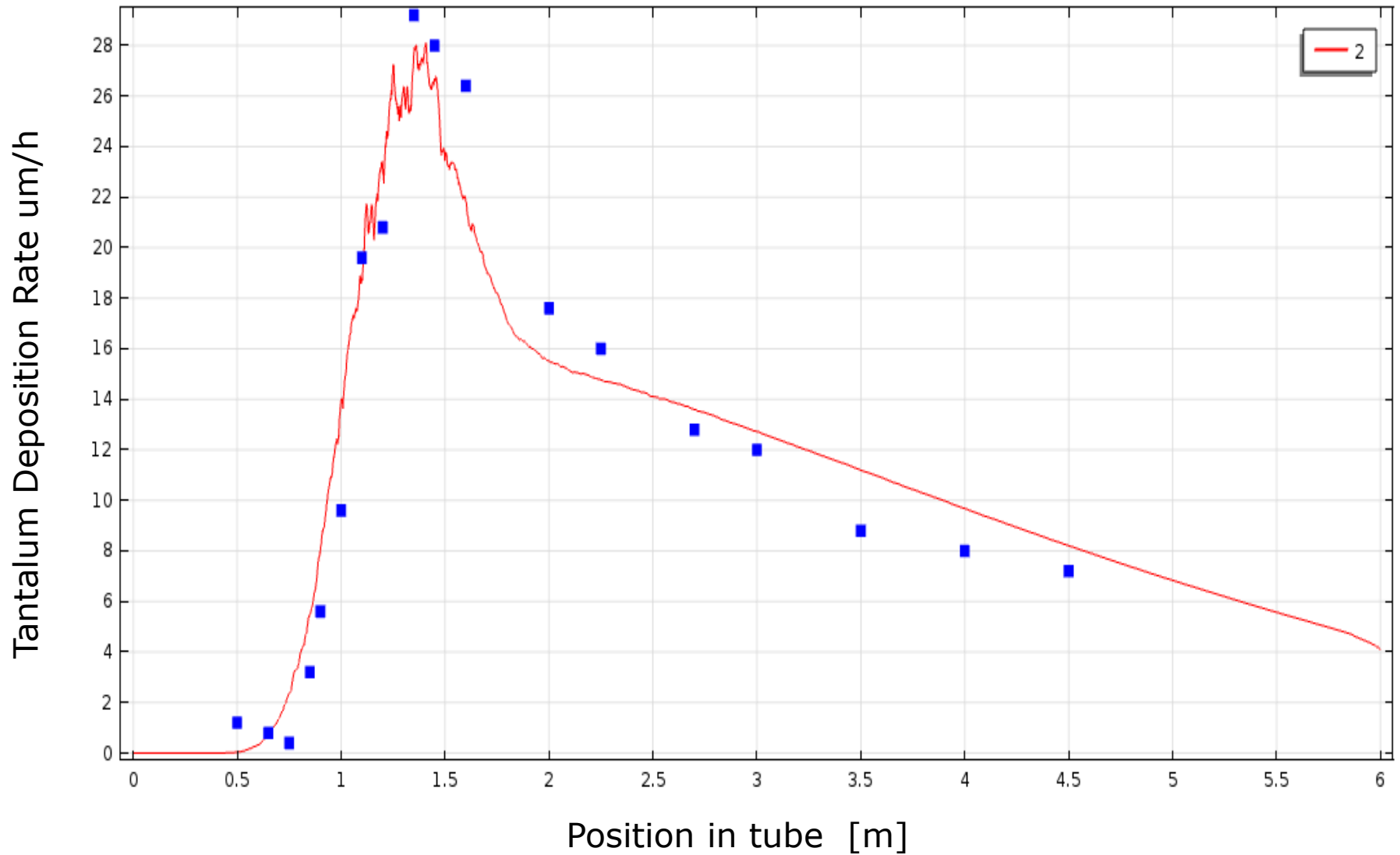
Geometry: 2D Axial Symmetry and 3D

Software: COMSOL MultiPhysics®

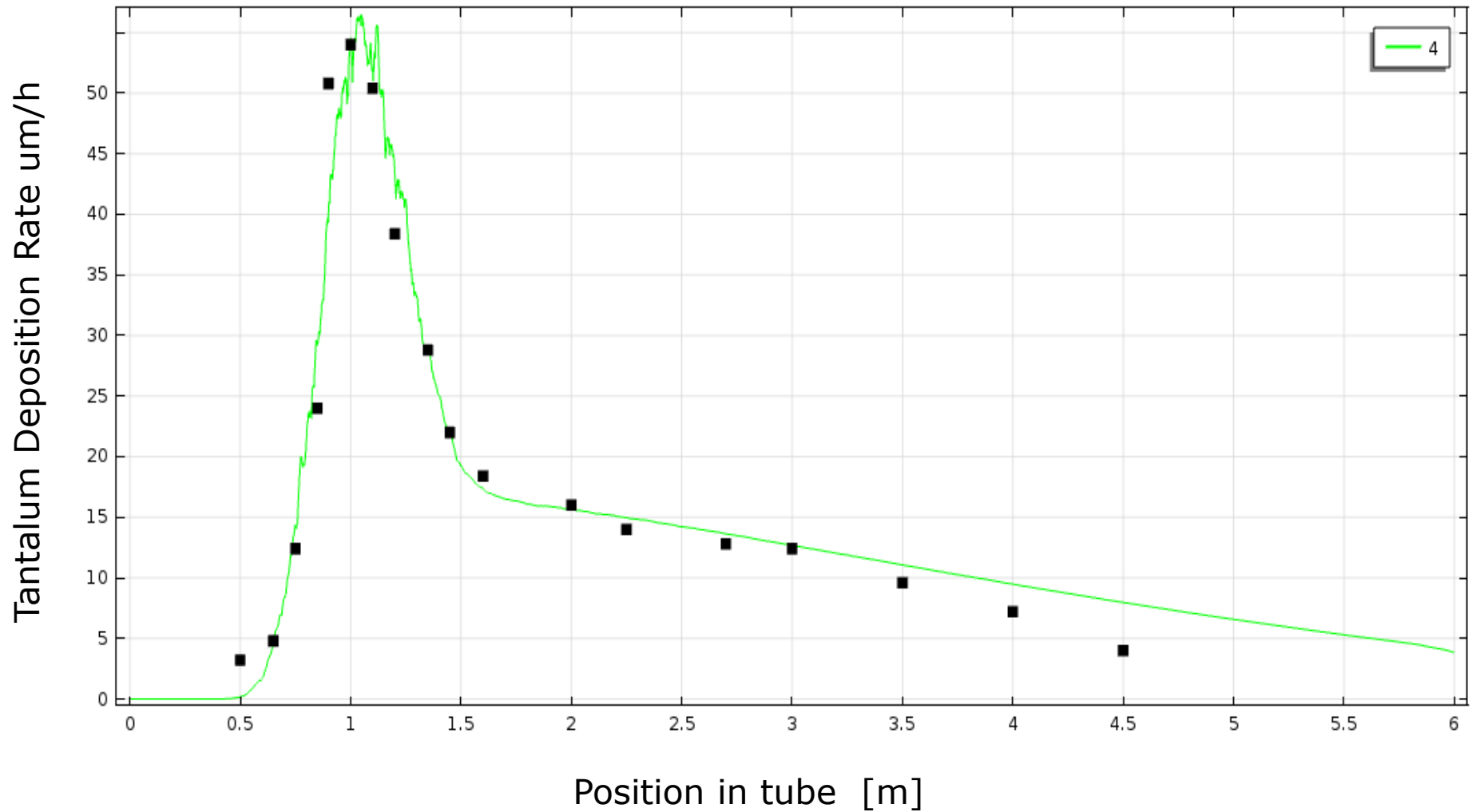
Mechanism



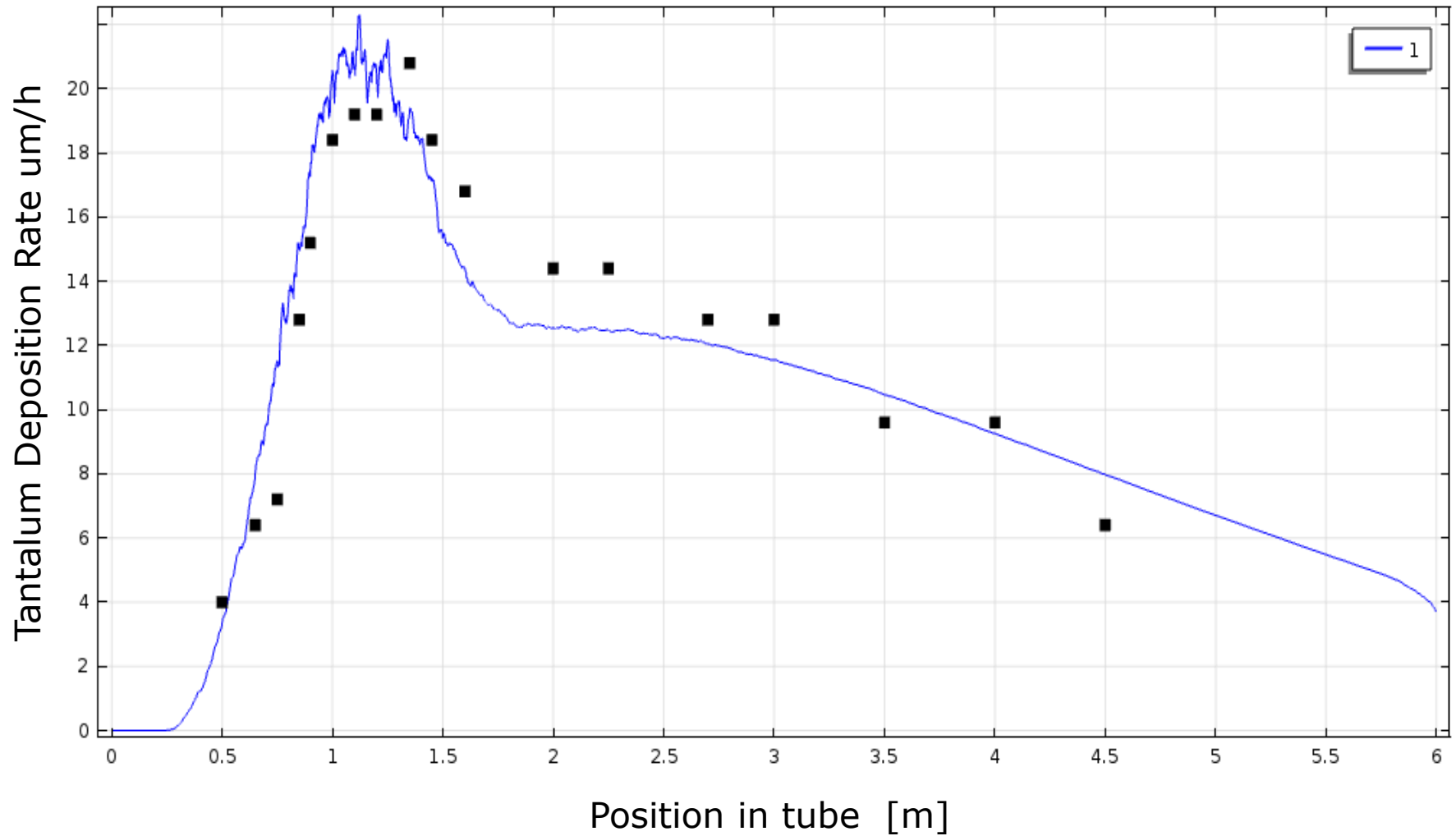
Model Fitting – 800 °C



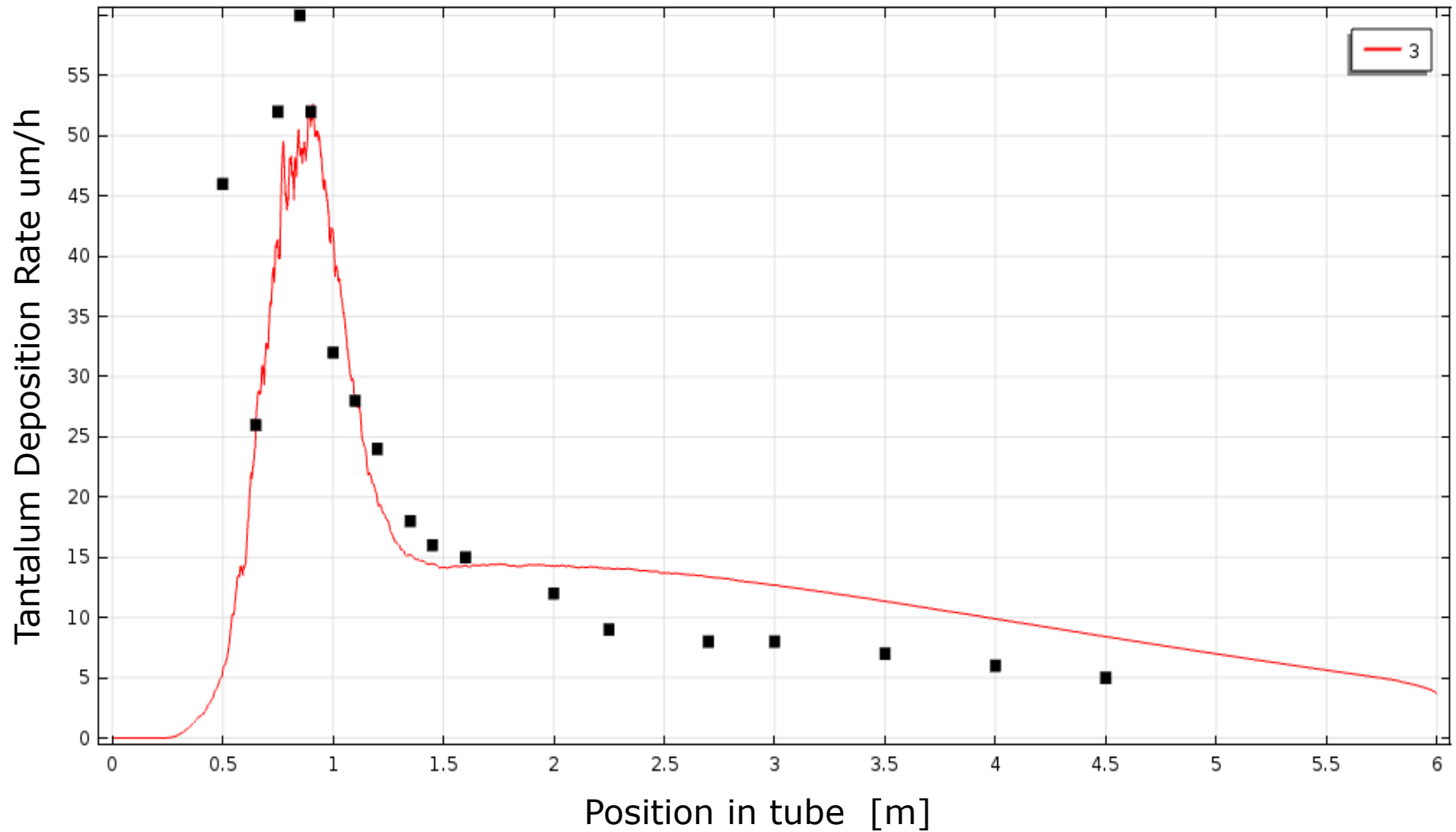
Model Fitting – 850 °C



Model Fitting – 900 °C

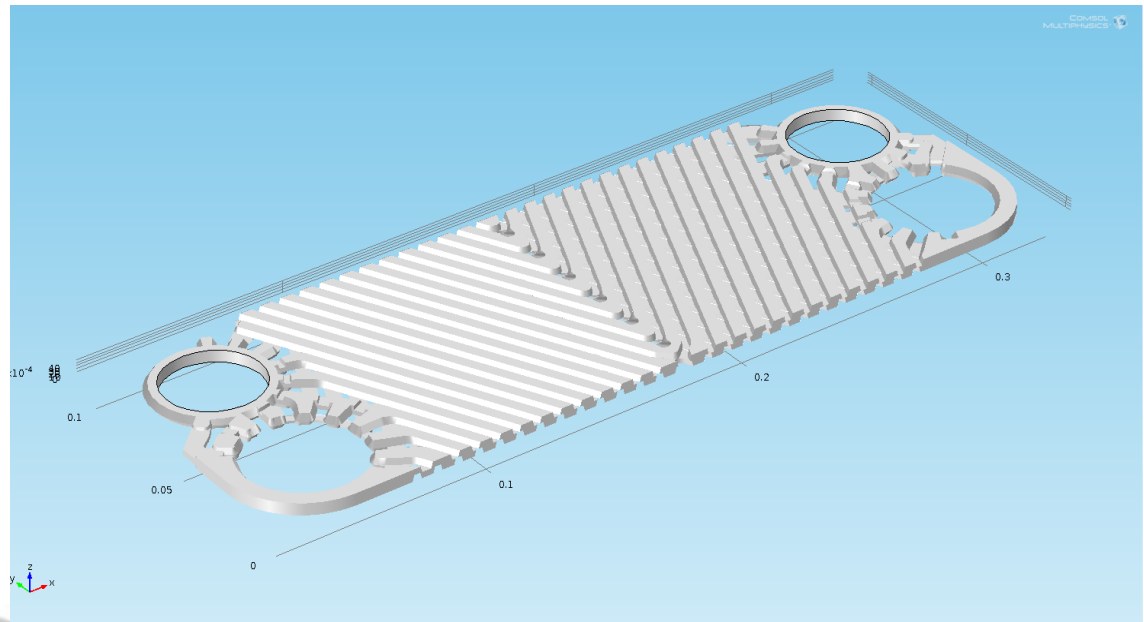
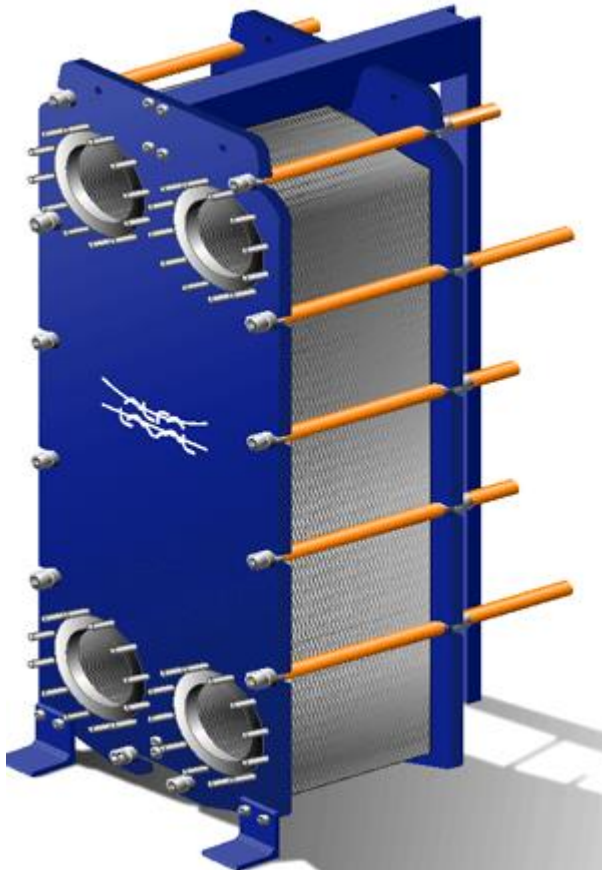


Model Fitting – 950 °C

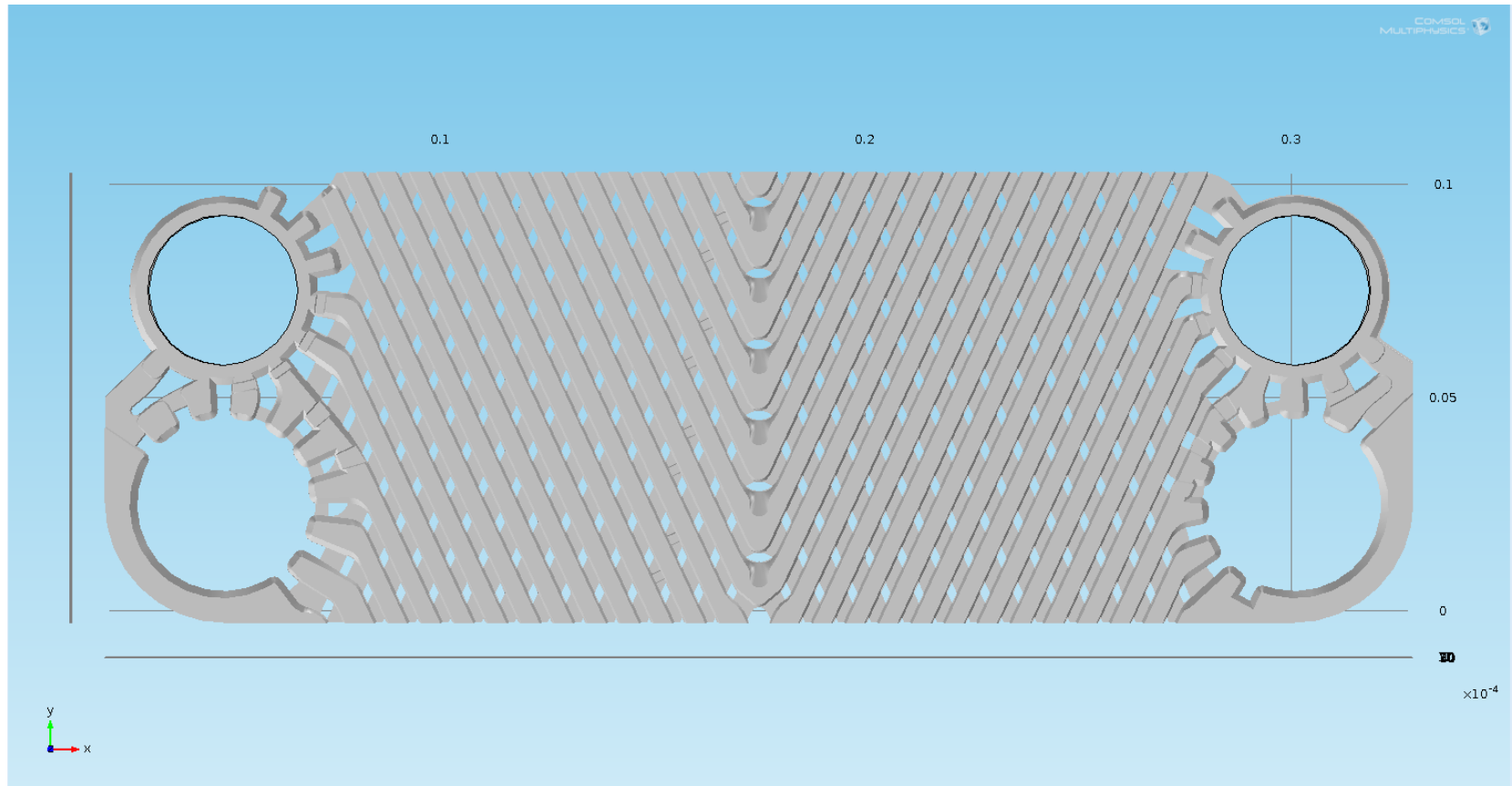


Application

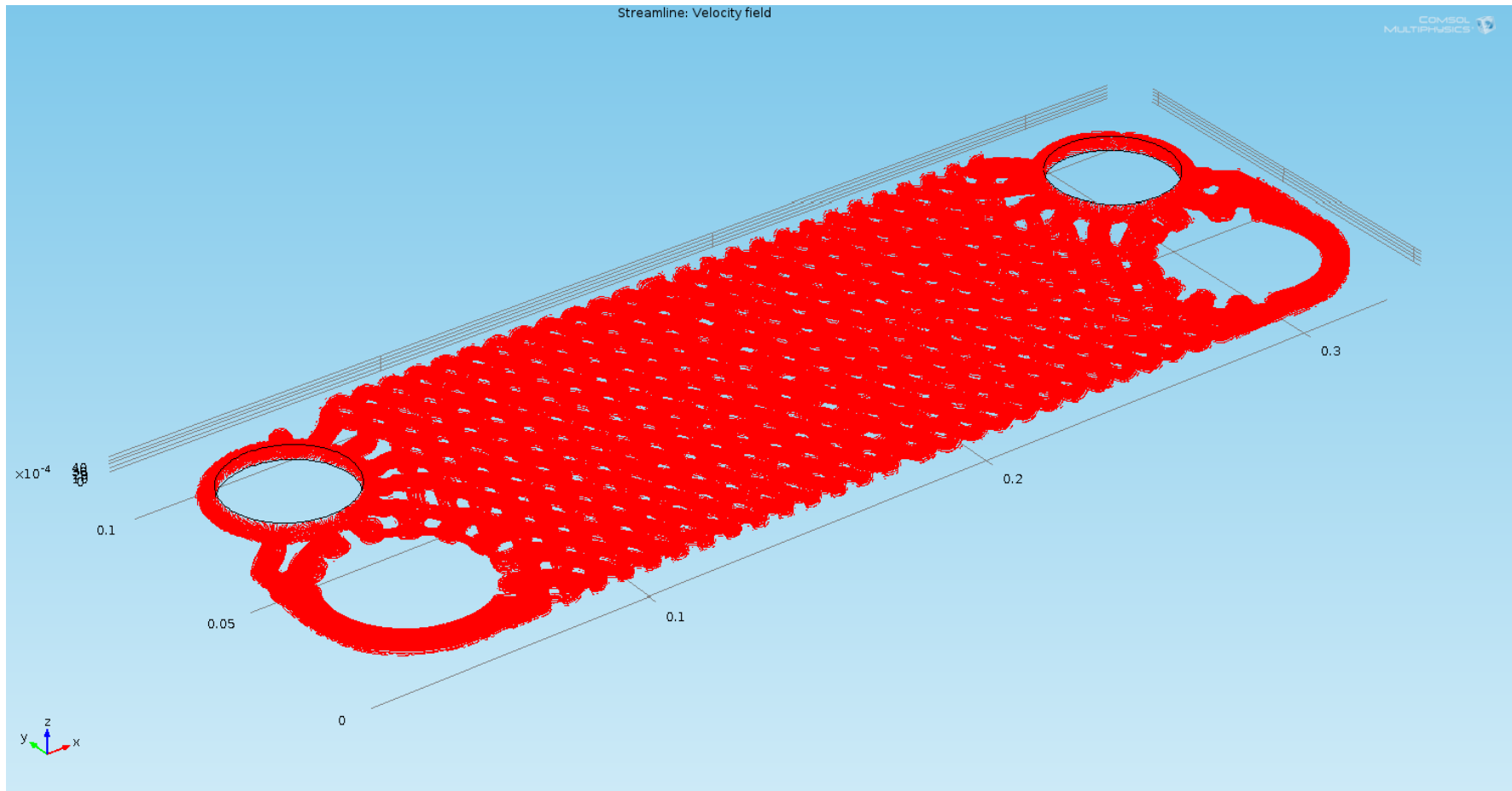
CB30 – Channel



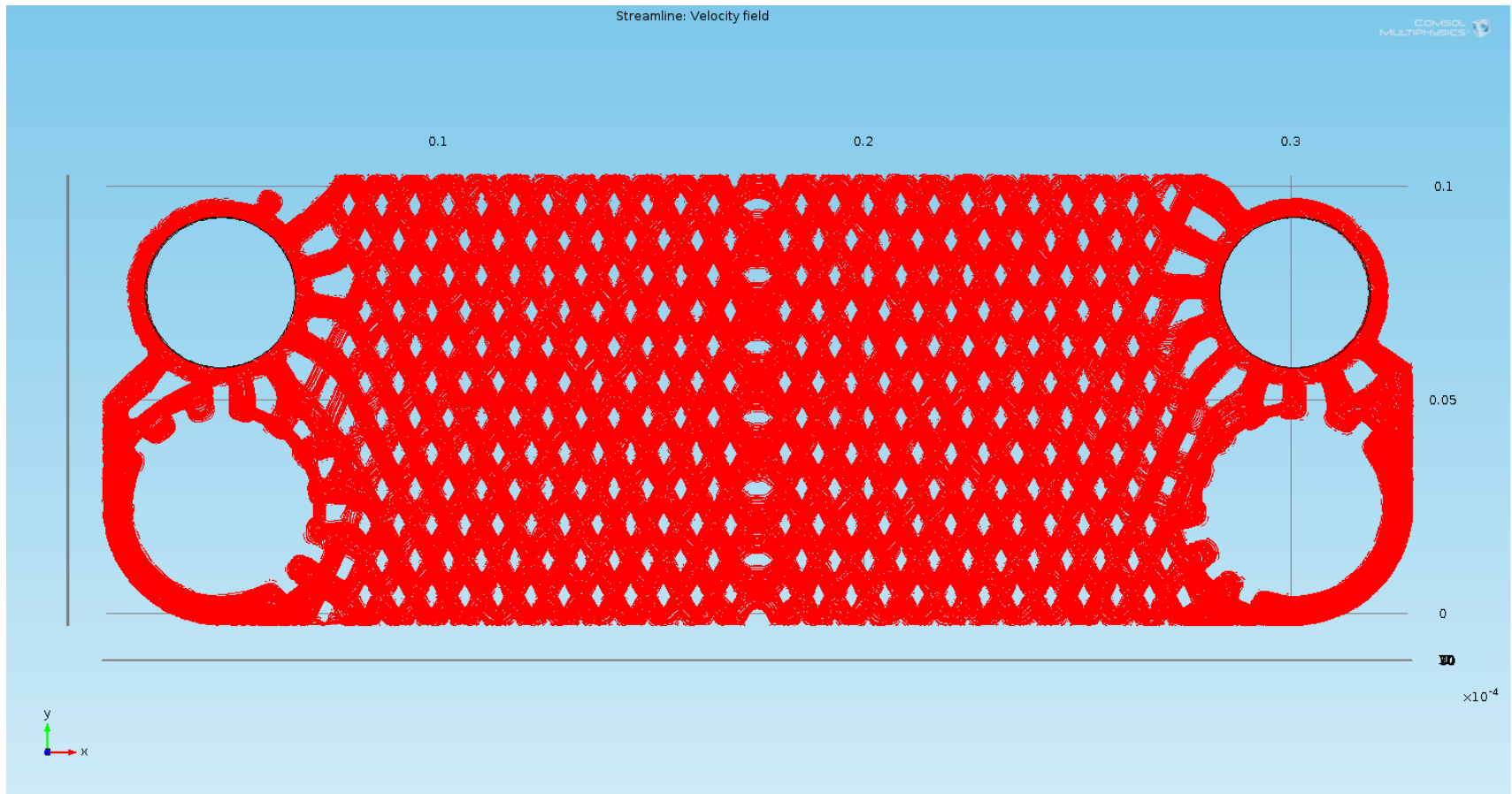
CB30 – Channel (X-Y Plane)



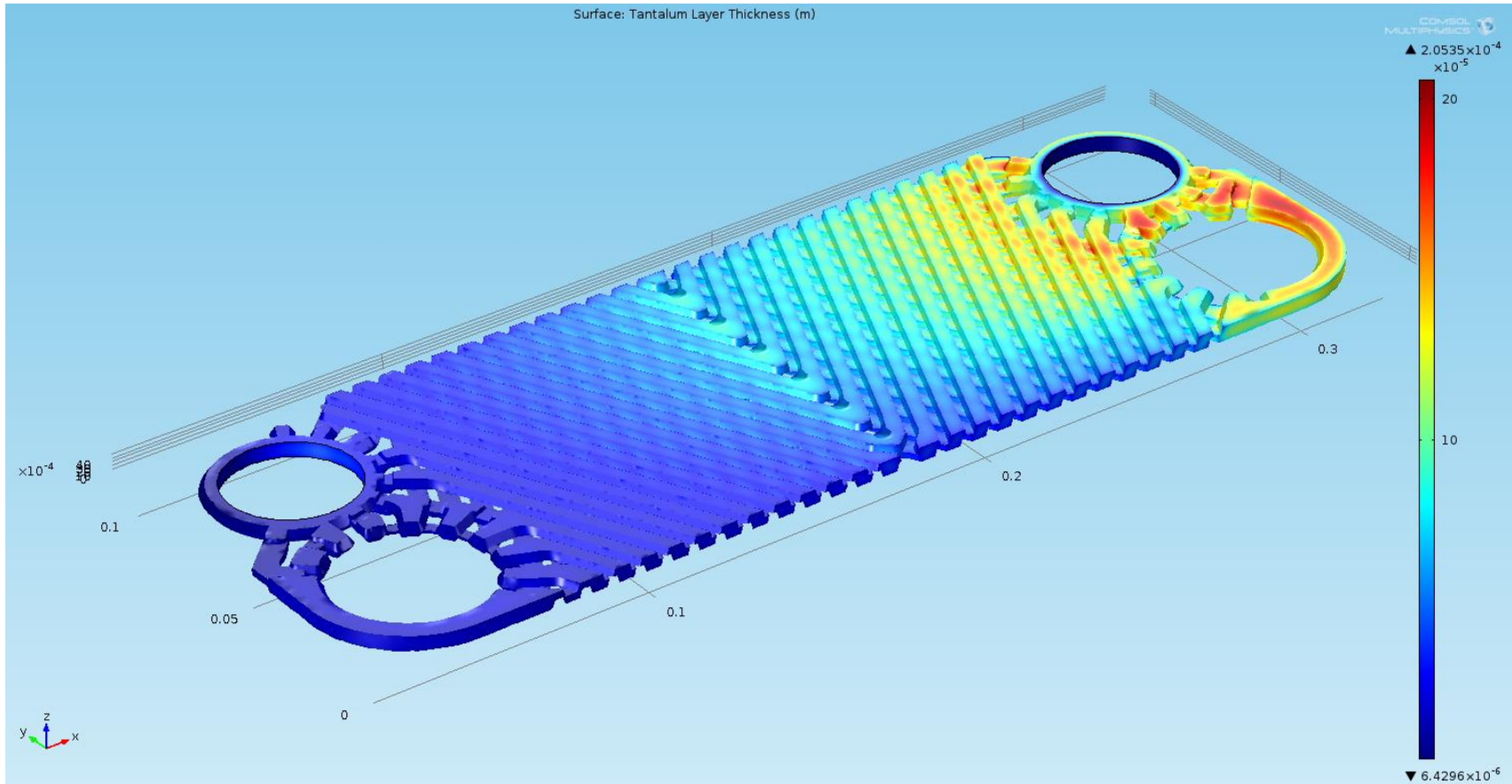
CB30 – Streamline: Velocity field Visualization



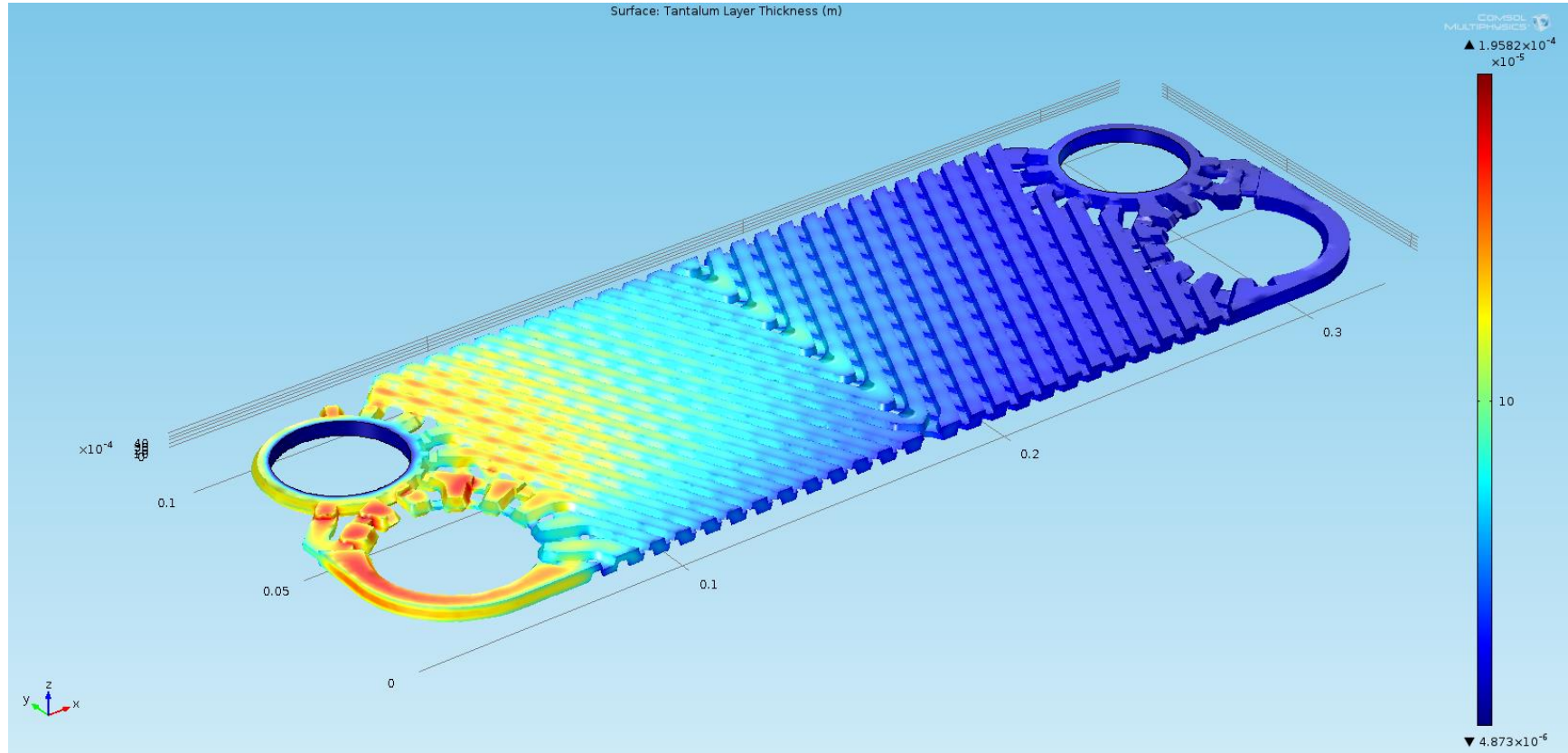
CB30 – Streamline: Velocity field Visualization



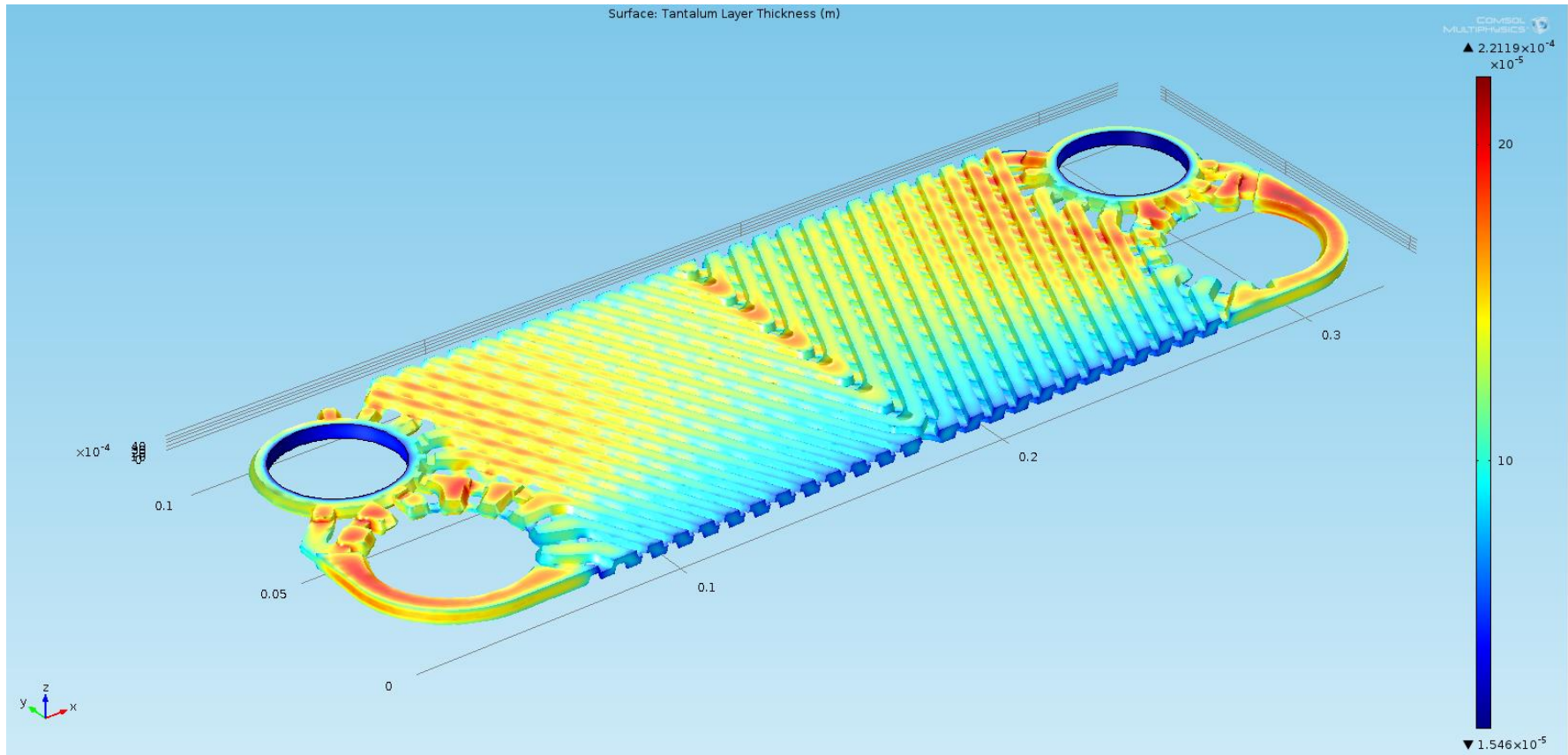
CB30 – 1st Run: Tantalum Layer Thickness (i.e. Only treated from the right end)



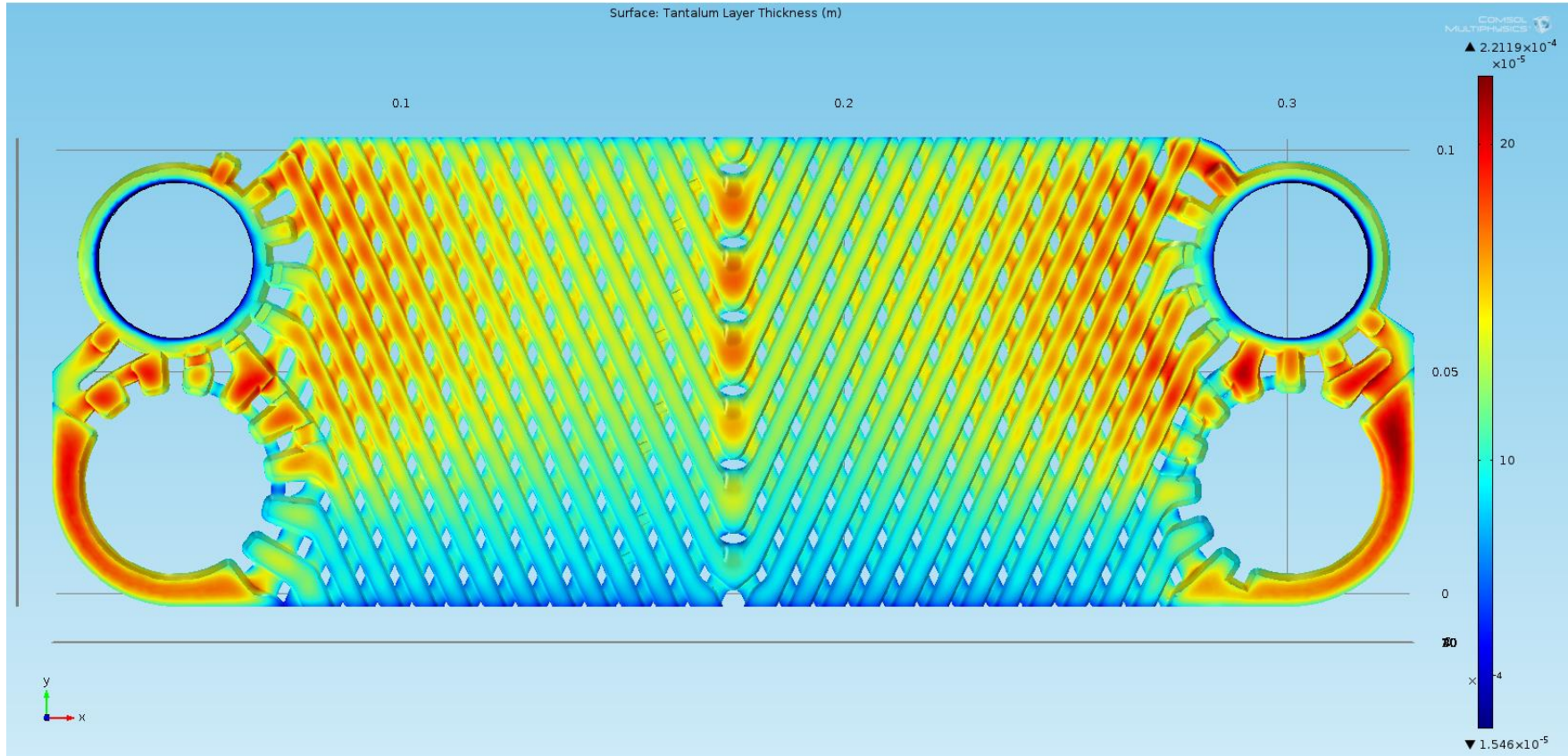
CB30 – 1st Run: Tantalum Layer Thickness (i.e. Only treated from the left end)



CB30 – 2nd Run: Tantalum Layer Thickness (i.e. Treated from the both ends)



CB30 – 2nd Run: Tantalum Layer Thickness (i.e. Treated from the both ends)



Thank you for your attention.